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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/798,770	03/12/2004	Mark Gottfried	L/E047B	6407
7590	10/05/2004		EXAMINER	
Casey Toohey Emcore Corporation 1600 Eubank Boulevard, SE Albuquerque, NM 87123			MALSAWMA, LALRINFAMKIM HMAR	
			ART UNIT	PAPER NUMBER
			2825	

DATE MAILED: 10/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/798,770	Applicant(s) GOTTFRIED, MARK	
	Examiner Lex Malsawma	Art Unit 2825	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 March 2004 through 15 Sept. 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 42-58(formerly 57) is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 42-48,50,51 and 55-58(formerly 54-57, respectively) is/are rejected.
- 7) ☒ Claim(s) 49,52,53 and 54(formerly 53) is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 53 (second occurrence) through 57 have been renumbered as 54-58.

2. Claim 46 is objected to because of the following informalities:

At claim 46, line 3, the examiner suggests deleting "at least one" before "opening".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 48 and 51 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. More specifically, both claims 48 and 51 are directed to "the step of etching" in claim 42; however, claim 42 does not recite any steps for etching, but rather, claim 42 recites two steps for "removing" (i.e., "removing metal" and "removing material");

accordingly, these claims are indefinite, since it is not clear as to which “removing” step is being referenced by either claim 48 or 51.

~~*Claim Rejections--35-USC § 102*~~

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 42, 43, 46, 47, 50, 55 (*formerly 54*), 56 (*formerly 55*), 57(*formerly 56*) and 58(*formerly 57*) are rejected under 35 U.S.C. 102(e) as being anticipated by Shibata et al. (6,008,539; hereinafter, “**Shibata**”).

Regarding claim 42:

Shibata discloses a method of forming electrodes on first and second respective regions of a semiconductor structure, comprising:

- a. depositing metal 81,82 on a surface of a first region of the semiconductor structure (Figs. 1-2A and Col. 4, lines 21-23 and lines 40-50);
- b. forming a patterned mask over the metal on the surface of the first region, the mask having an opening so that a first portion is covered by the mask and a second portion aligned with the opening is left uncovered by the mask (Figs. 1 and Col. 4, lines 23-26);

c. removing metal aligned with the opening in the second portion thereby defining a first electrode 8A overlying and making electrical contact with the first region 7 (Fig. 1) of the semiconductor substrate;

~~d. removing material of the semiconductor structure aligned with the opening in the~~
second portion to expose a surface of the second region 3 (Fig. 1) of the semiconductor structure (Col. 4, lines 30-34); and

e. forming a second electrode 8B (Fig. 1) making electrical contact with the second region 3 of the semiconductor structure. Therefore, this claim is anticipated.

Regarding claims 43, 46, 47, 50 and 55-58 (formerly 54-57, respectively):

Shibata discloses depositing a first metal 81 and a second metal 82 (Fig. 2A);

applying a resist layer and patterning the resist layer to form the opening over the second region so that the remaining resist layer overlies the first region (Col. 4, lines 23-26);

removing the metal by etching (Col. 4, lines 26-28);

removing the material from the semiconductor structure by reactive ion etching (Col. 4, lines 30-33);

the first region includes a p-type semiconductor layer (6 and/or 7 in Fig. 1) and the second region includes an n-type semiconductor layer 3 arranged beneath the p-type semiconductor layer, the structure having a junction between the p-type and n-type layers (Fig. 1 and Col. 4, lines 1-9);

an upwardly protruding portion comprising the p-type layer (6/7) and a lower region comprising a portion of the n-type layer 3 (Fig. 1);

the metal (8A) covering a large portion of the semiconductor structure in the first region, the metal being in contact with the p-type layer 7; and forming the second electrode by depositing metal (i.e., Al, note Fig. 1 and Col. 4, lines 14-15). Therefore, these claims are anticipated.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Shibata** (6,008,539) in view of Shibata et al. (6,191,436 B1; hereinafter, "**Shibata-II**").

Shibata anticipates the method of claim 43 and further discloses the first metal comprises nickel and the second metal comprises gold. However, Shibata **lacks** specifically disclosing annealing the structure so that the metal layers form a substantially transparent material.

Shibata-II is **cited primarily to show** that the Nickel/Gold metal layer in Shibata would be a transparent electrode formed by annealing/alloying (note Shibata-II, Col. 3, lines 13-15 and 40-45). It would have been obvious to one of ordinary skill in the art to modify Shibata by specifically recited that the Nickel/Gold metal is transparent by annealing because Shibata-II shows, in a device similar to that in Shibata, that a transparent electrode is formed by annealing/alloying Nickel and Gold.

9. Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Shibata** (6,008,539) in view of Beyea et al. (5,063,174; hereinafter, "**Beyea**").

Shibata anticipates the method of claim 42 but **lacks** depositing the metal using electron beam deposition; however, it is important to note that Shibata does not specify any particular method/process for depositing the metal; accordingly, one of ordinary skill in the art would have utilized any well-known method/process when depositing the metal. Beyea is cited to show was very well known in the art to deposit a metal, for an ohmic contact (i.e., an electrode), utilizing electron beam deposition. Beyea discloses (in Col. 6, lines 6-11) that electron beam deposition is just one of a plurality of well-known methods for depositing metal; accordingly, since Shibata does not specify any particular metal-deposition process, it would have been obvious to one of ordinary skill in the art to modify Shibata by specifically reciting that the metal is formed by electron beam deposition because Beyea shows that electron beam deposition is just one of a plurality of well-known metal-deposition methods.

Allowable Subject Matter

10. Claims 49, 52, 53 and 54 (*formerly 53*) are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The following is a statement of reasons for the indication of allowable subject matter:

Claims 49-53 and 54 (*formerly 53*) would be allowable primarily because claim 49 requires removing the material while the resist layer remains over the first region, i.e., Shibata

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specifically removes the resist layer such that the "patterned metal layer" in the first region can be used as an etching mask.

Conclusion

~~12. The prior art made of record and not relied upon is considered pertinent to applicant's~~
disclosure.

The references listed on the attached Form PTO-892 (not cited above) are cited to show method of forming devices using process steps similar to those of the current invention.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lex Malsawma whose telephone number is 571-272-1903. The examiner can normally be reached on Mon-Fri (8 hours between 5:30AM and 8:00 PM EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lex Malsawma



September 30, 2004



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